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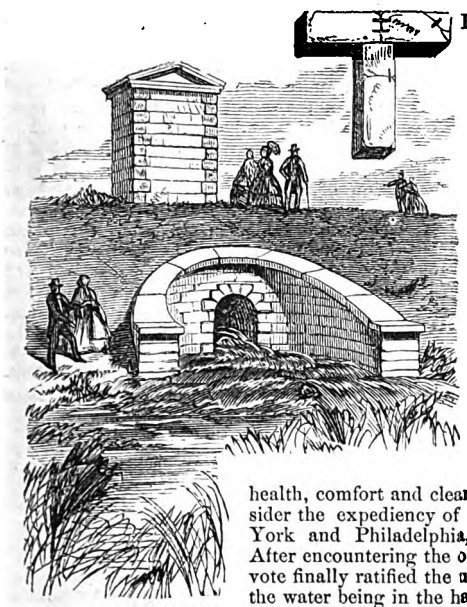
THE COCHITUATE WATER-WORKS.

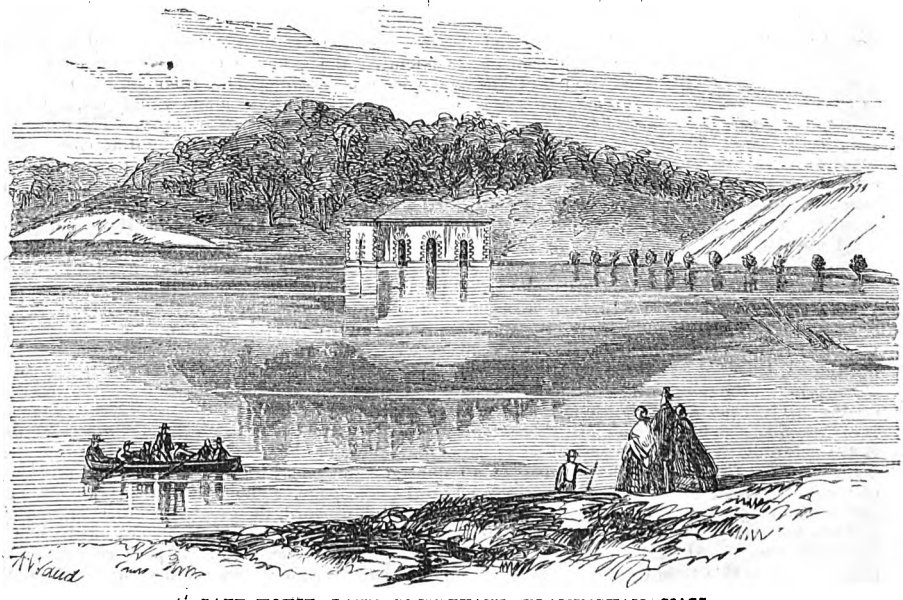


WASTE WIER OF COCHITUATE AQUEDUCT, WEST NEEDHAM.

THE interest naturally felt by our citizens in their great system of water-works, has prompted us to offer in the present number of our Magazine a series of views drawn expressly for us by Mr. A. Wand, who visited the whole line of water-works for this purpose, and made his sketches on the spot. His drawings, eight in number, delineate the Waste Wier of the Cochituate at West Needham, the Gate House, Framingham, the Cochituate Dam in the same town, a Viaduct at Newton Lower Falls, the Bridge over the Charles River at Newton Lower Falls, the Brookline Gate House, Large Reservoir at Brookline, and the Beacon Hill Reservoir in this city, a structure Roman in its character of simplicity and solidity. Apart from their illustrative purpose, many of these pictures are pleasing as mere landscapes. Not many years since, the inadequacy and bad water of the city of Boston, the inability of the Jamaica Pond Company to supply the higher parts of the city the total dependence of a large portion of the population on rain water for the purpose of washing, the importance of an ample supply to ensure the health, comfort and cleanliness of the city, induced our authorities to consider the expediency of adopting the example of the sister cities of New York and Philadelphia, where water-works had been long in operation. After encountering the opposition which awaits all new projects, a popular vote finally ratified the undertaking by a decisive majority. The control of the water being in the hands of the city, the people enjoy it at cost. After an examination of the various sources of supply, a board of commissioners was appointed by the City Council in 1844, "to report the best mode and the expense of bringing the waters of Long Pond (now Lake Cochituate) into the city." The late Patrick T. Jackson, Nathan Hale and James F. Baldwin composed this board of commissioners—gentlemen eminently qualified to fulfil the important task assigned. The vacancy created by the death of Mr. Jackson was filled by the appointment of Mr. Thomas B. Curtis, and under their superintendence the work was completed in 1848. After Long Pond had been decided on, the commissioners secured the services of Mr. E. Sylvester Chesborough and Mr. W. S. Whitwell, as engineer and assistant engineer, with Mr. Jervis, of the New York Croton Works, as consulting engineer. Work was commenced on the 19th of August, 1846. Long Pond, or Lake Cochituate, the source of the aqueduct, is a large sheet of water lying in the towns of Natick, Framingham and Wayland, and the distance from the reservoir on Beacon Hill to the gate house at the lake, by the line of water-works, is twenty miles. The lake is of irregular shape, with indented shores, and its greatest extent is from north to south. Its area is 684 acres. The aqueduct commences at the eastern shore of the pond, and is carried out some distance into it. The works here consist of a bulkhead arranged with gates, and for the protection of the work, a gate house of granite, delineated on the next page. The aqueduct is built of brick, and is of an egg-shaped oval form, with the broader end downward, the greatest width being five feet, and the extreme height six feet four inches, composed of brick masonry eight inches thick, laid in hydraulic cement. This form of construction secures the greatest strength. A plastering of cement is laid on the inside from the bottom to the top of the water line, and also on the outside from the top to the chord line of the lower or inverted arch. By this means the escape of water from the

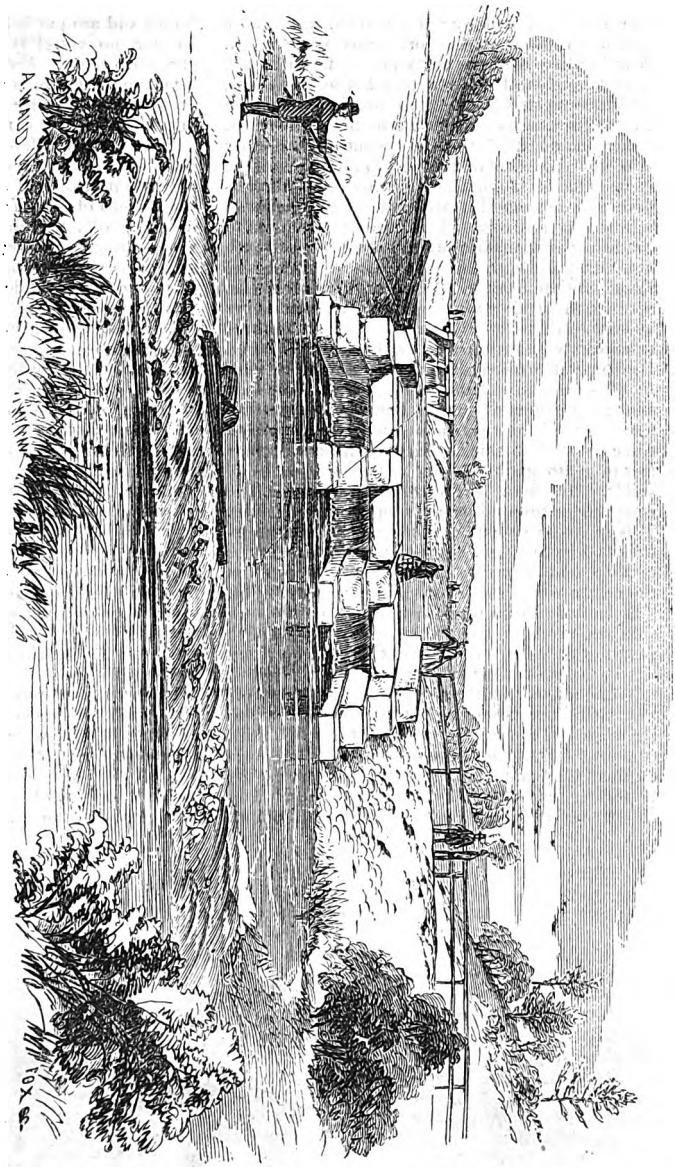
inside, or its intrusion by percolation from the outside, is guarded against. The aqueduct descends three inches to the mile. At the natural outlet, where the lake flows into Concord River, a dam has been constructed of stone masonry to close the lake or regulate the discharge of water from it. The daily discharge of water through the aqueduct itself is estimated at about 7,000,000 wine gallons. At Newton there is a remarkable piece of work consisting of a tunnel cut through a ledge of rock 2410 feet in length. Through the greater part of this distance the roof of the tunnel consists of solid rock of a hard and durable character; but the remaining portion having a tendency to decompose by exposure to the atmosphere, is lined with brick masonry. Wherever, on the line, pipes are substituted for the aqueduct, waste wiers have been erected for the discharge of such surplus water as is not received by the pipes. Gates to regulate the fall of water are enclosed in suitable buildings. Our first engraving represents one of these water wiers.

The Brookline reservoir has an area of nearly twenty-three acres, twenty-three feet deep in the easterly portion, and ten feet in the westerly. At the western end is a granite structure for the receiving gates, where the great brick conduit enters. The bank surrounding the reservoir consists of earth, principally sloping on each side, and is rendered impervious to water by a bank of puddled earth in the middle, going so far below the natural surface of the earth as was found necessary to connect it with a tight bottom. The exterior front of the embankment, where it rises beyond eight feet in height, is supported at the base by a bank wall, the material of which was taken partly from a quarry foundation within the basin, and partly from the Quincy granite quarries. At the eastern extremity of the reservoir is the beautiful gate house of granite, represented in one of our engravings. The gates to receive and shut off the water are fitted in solid and durable masonry. The floor is on a level with the surface of Lake Cochituate. This building contains the requisite chambers and passages for regulating the delivery of water, either from the reservoir, or, in case of absolute necessity, from the aqueduct itself. These iron pipes, each three feet in diameter, lead from the chambers and connect with the main pipes conducting into the city. The water pipes, laid twenty feet below the ordinary level of the reservoir, enter the city through Brookline and Roxbury, over the Tremont Road. We give a view, among our sketches, of the main reservoir of the city on Beacon Hill, an imposing granite structure, built to endure through time. It is situated near the State House, on a lot of ground bounded by Derne, Temple, Mt. Vernon and Hancock Streets. The corner-stone of the reservoir was laid on Saturday, November 9, 1847, by the mayor, in presence of the City Council, and a vast body of citizens and strangers. This reservoir is of granite, the foundation being laid and every part of the work performed with the most scrupulous fidelity and care, and with a view to the greatest durability. It is built on arches of fourteen and three-fourths span, which, in consideration of the enormous pressure to which they are subjected, were set on foundations of immense strength. The reservoir covers an area of 40,000 feet, and will hold three millions of gallons of water. The water is raised 112 feet above the tide level, and six and a half feet above the level of the floor of the State House. The water was let into the brick aqueduct at the lake October 12, 1848, at 11 o'clock, A. M. No accident marred the introduction of the Cochituate into the city. The celebration took place



GATE HOUSE, LAKE COCHITUATE, FRAMINGHAM, MASS.

October 25, 1848, with imposing ceremonies. The water works are now under the superintendence of Mr. James Slade, City Engineer. We should have mentioned that the conduit is not continued over the valley of the Charles River, but three lines of iron pipes are laid instead, two of them 30 inches, the other 36 inches in diameter. These descend the sides of the valley in the natural earth, but cross the river on a granite bridge of three elliptical arches of thirty feet span, and seven and a half feet rise. These iron mains were each originally nine hundred and seventy-nine feet long. Since the break they have been lengthened about one hundred feet, and are now less liable to accident than formerly. The pipes descend sixty-one feet, and the water in the river is seventy-four feet below the top of the conduit. At each end of this valley are pipe-chambers for regulating the flow of water through the pipes. There is but one ventilator in the whole length. It is found that the water becomes sufficiently aerated while passing through the Brookline reservoir on its way to the city, and that even this one ventilator might be dispensed with. There are four waste wiers on the line of conduit which are used to let off water whenever the conduit is to be cleaned out, or whenever any accident occurs which requires expeditious repairs. It is usual to draw off the water once in each year, to examine, repair and clean it out. Nearly the entire length of the conduit is laid below the natural surface, part of the way thirty feet deep, and in the tunnels from sixty to eighty feet deep. There is a very neat granite viaduct near the Charles River pipe valley. The conduit at this point is in very heavy embankment, and crossing a town road, it became necessary to build a viaduct under the conduit large enough for the passage of the largest teams in each direction at the same time. This viaduct, embankment and bridge over the river form altogether quite an attraction to the neighborhood. The principal reservoir is in Brookline, and contains 120,000,000 gallons of water suitable for use. There are three sets of gates to regulate the flow of water to the three mains to the city. These are of iron, with composition bearing surfaces, worked with iron screws in composition nuts. The mains leading to the city are of cast iron,

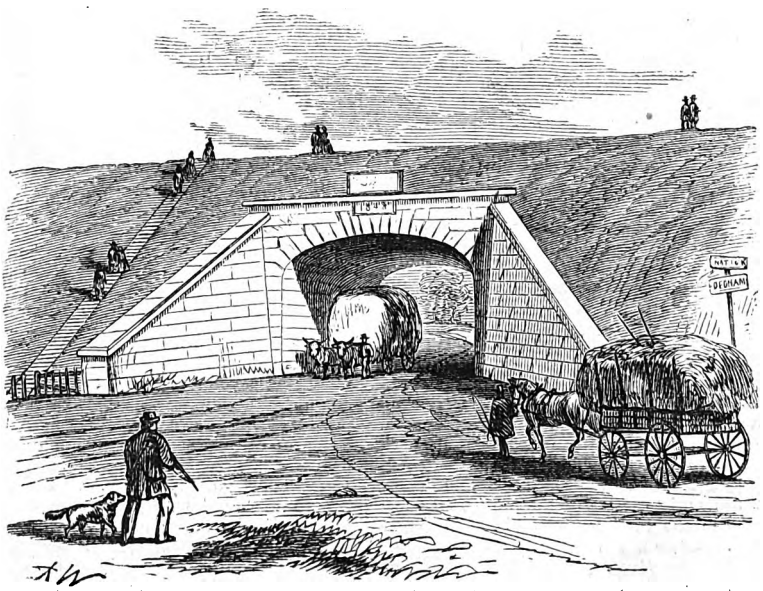


COCHITUATE DAM, FRAMINGHAM, MASS.

one thirty-six and one thirty inch, which were laid when the work was originally constructed. Another line of pipes, forty inches in diameter, is laid from the Brookline gate house to the city, which connects with the two previously laid in two or three places, in such a manner that when either one of the three lines is shut off, the other two will give their full supply to all parts of the city. One of the mains leads directly to the reservoir on Beacon Hill, from which it radiates to all parts of the city. The other main leads to the lower portions of the city, as well as to South and East Boston, by pipes of a smaller size branching off from it. The main pipes are so arranged that the supply through either one may be sent to all parts of the city. There are three reservoirs within the city. The principal one on Beacon Hill we have noticed. The walls vary in thickness from two and a half to three feet, with foundations of granite four and a half and five feet thick, resting on concrete varying from three to six feet thick. The basin is fourteen feet in depth and contains 2,700,000 gallons of water. Its area is 28,000 square feet. The reservoir in South Boston is on Telegraph Hill. It is in shape a segment of an ellipse, and measures 370 by 260 feet. It is built with an entire earthen embankment, having a puddle wall in the centre which makes it perfectly water-tight. The bank is fifteen feet in width on top, the outside slope sodded, and the inner slope faced with rough granite blocks to prevent the waves from beating down the banks. It will contain when full 7,500,000 gallons of water. The reservoir in East Boston is on Eagle Hill. It is rectangular in shape, measuring 325 by 150 feet. It will contain 5,500,000 gallons of water. The pipes on their passage to South and East Boston cross tide-water, and pass in syphons under four deep channels. They are strongly incased in timber boxes and are put below the bottom of channels, so that no vessel lying over them at low water can harm them. From Chelsea to East Boston a portion of the pipe is laid with a flexible joint. It was put together on a platform above water and lowered till it came to a firm position.

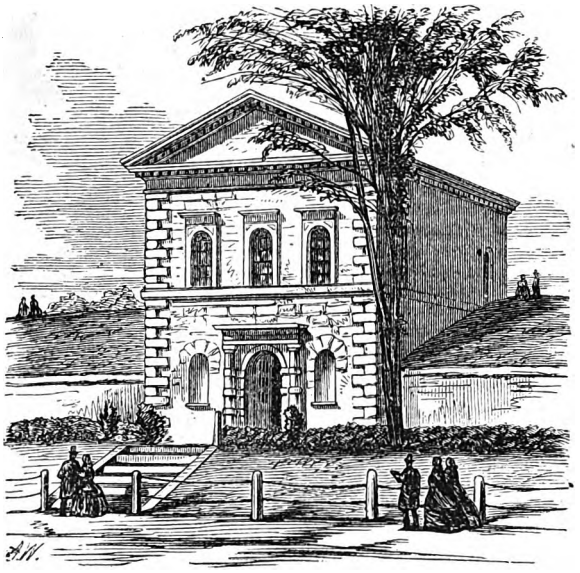
The Croton Water-Works, supplying New York city, are of an earlier date than ours. The absolute necessity of a supply of pure water for the citizens of New York, led to the undertaking, in 1837, of the immense Croton Aqueduct, a work without precedent since those Roman constructions which have perpetuated the grandeur of the great republic of ancient times. The Croton, a small river rising in the Catskill Mountains, and about sixty miles from New York, at the above period swelled with its tributary stream the lordly Hudson. To bring this river to New York, they stopped it some miles above its mouth by means of a dike, which forced the waters back into a reservoir, a sort of lake hollowed in the centre of fifty acres of land, and containing many million gallons of water. This dam, built of earth, and strengthened with solid masonry, was sixty feet thick at its base, and fifty feet in height. As the reservoir was deeply enclosed, it was necessary, to leave an issue to this immense mass of water, to dig a tunnel through one of the surrounding hills. To this tunnel the aqueduct was joined, six and a half feet broad, nine feet high, and built entirely of walls four feet thick—a masterpiece of hydraulic masonry.

From this first reservoir the aqueduct traverses twelve hills by means of subterranean tunnels, of which several were cut through rock. Near the town of Sing Sing, where the State Prison is located, they had to cross a deep ravine, over which a bridge of a single arch was thrown, which presents an elliptical development of 88



VIADUCT, NEWTON LOWER FALLS.

feet, and whose height is a hundred feet above the torrent which dashes noisily into the bed prepared for it. Another ravine, broader but shallower — that of Sleepy Hollow—was crossed by a bridge of five arches. But the most gigantic labor of this structure is the bridge over the Harlem River, which brings the water into Manhattan Island. On issuing from the Harlem Bridge, at King's Bridge, the aqueduct is resumed in masonry, which traverses the hill of Manhattanville, nearly at its summit, in a tunnel a quarter of a mile in length. Then, on issuing from this tunnel, the aqueduct is composed of pipes, like those of the bridge, which descend an inclined plane to the depth of two hundred feet, and afterwards ascend to a similar height on the opposite hill. The valley of Clendenning, the last wet in its whole course, is crossed by means of a bridge, whose highest arch is 40 feet in height.



BROOKLINE GATE HOUSE.

On the other side of the valley is the first reservoir. It is situated at Yorkville, sixty miles from Croton lake, and forms a parallelogram of a capacity of thirty-five acres, surrounded by a wall of rough masonry about sixty-five feet high. The soil, composed of argillaceous earth mixed with rocks, serves as a base to this immense structure, the interior of which is divided into two reservoirs. These vast basins are destined to form a reserve, in case the flow of the water should be interrupted by any damage to the aqueduct. It contains 160,000,000 gallons water.

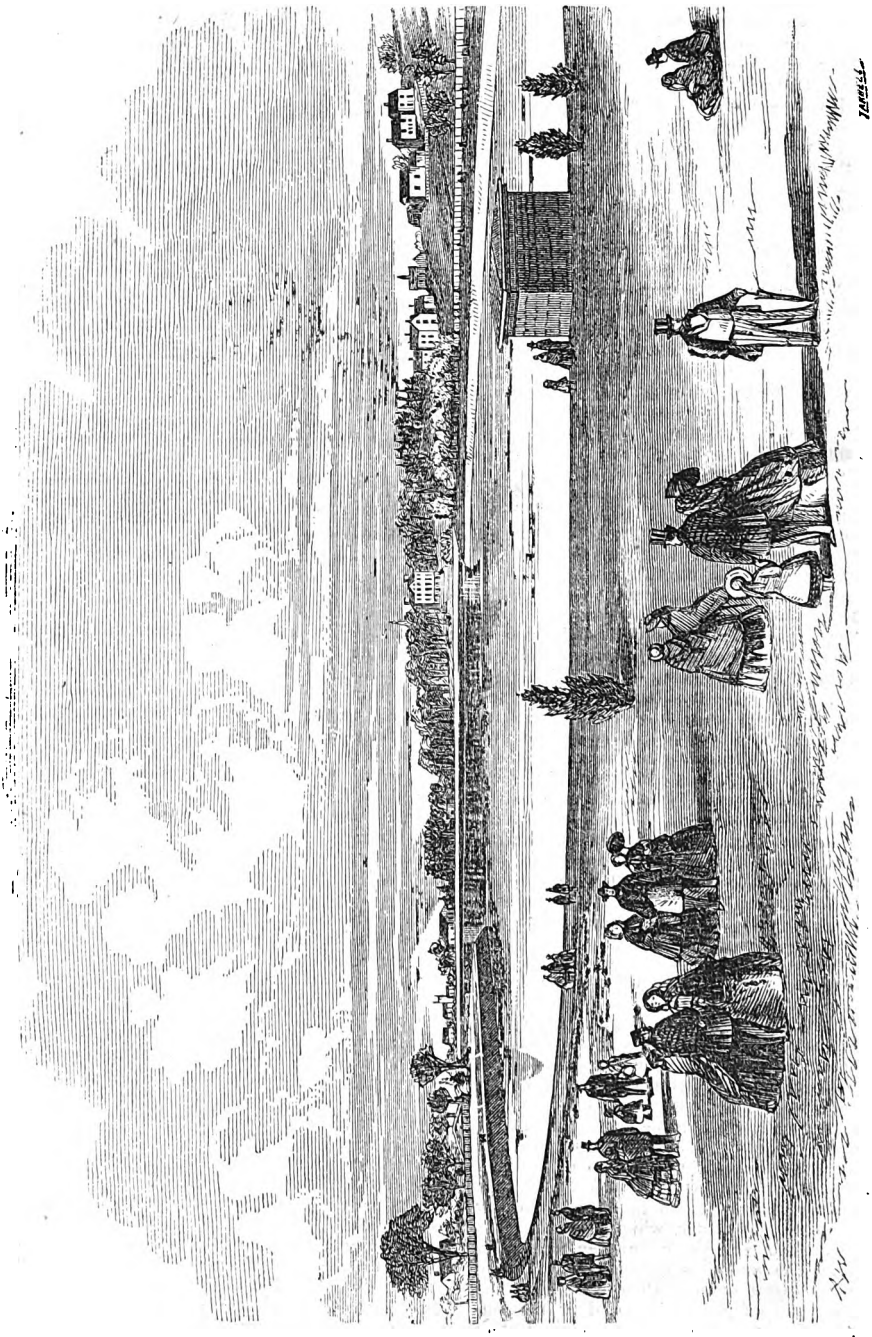
The second basin, which is the distributing reservoir, is situated on Murray Hill, in 42d Street. It is smaller than that of Yorkville, but its structure is of more remarkable workmanship. It forms an oblong square, and covers a space of five acres. The bed of the reservoir is of impermeable masonry, covered with flags of gray marble. It is 440 feet square, and is divided into two compartments by a wall 19 feet thick at the base and five at the summit. The four walls which form the parallelogram are 35 feet at the base, and narrow as they rise, so as to form on each face a slightly inclined plane. The perpendicular height of the outer face is 60 feet, that of the inner face, which forms the depth of the reservoir, is 48 feet. The water rises to 40 feet, and composes a mass of twenty-two million gallons. At the eastern extremity of the division wall is a discharging tunnel in masonry, to get rid of the surplus water, which communicates with a subterranean aqueduct ending in the river Hudson. The tunnel is perpendicular; but to prevent the cascade mining the soil as it falls, an enormous block of granite is placed at the bottom, which is always covered with eight feet of water.

The architecture of this reservoir is of severe aspect. It might be taken for one of the fortresses of Upper Egypt, monuments of the Pharaohs and Osirises. It is a structure belonging to the style of the ancient cities found in Yucatan, and whose analogy to those of Egypt is remarkably curious. This reservoir and the Tombs in Centre Street are the only monuments of this kind in New York. From the top of this reservoir, on the esplanade formed by the walls, you have a view of the whole city of New York, and when the sky is clear and limpid, the eye can embrace the magnificent panorama of the empire city of the United States, from the north to the Narrows, and the distant horizon of Staten and Long Islands.

The two reservoirs we have just described communicate together by a double line of cast iron pipes three feet and a half in diameter. The water is also conveyed into the city by a double range of pipes, from which branch smaller ones at the intersection of each street, forming a vast subterranean network whose innumerable meanderings glide into all the houses of New York, and ascend to the highest story of each building.

In a word, the Croton Aqueduct forms an immense subterranean gallery of masonry, eight feet five and a half inches high, by seven feet five inches broad. This structure extends sixty miles from Croton River to the distributing reservoir. The water traverses sixteen tunnels, varying in length from a hundred and sixty to one thousand nine hundred and ninety-five feet.

At Sing Sing the aqueduct passes over a ravine a hundred feet deep, by the aid of a bridge eighty-eight feet broad and twenty-five feet thick. At Harlem it crosses the river in a place where it is nine hundred feet broad, on a bridge composed of eight arches one hundred and fifty feet each above the water, and seven other arches whose height varies according to the inclination of the two mountains. The length of this bridge is two thousand three hundred and fifty feet. In order to give free passage to the streams and springs intersected by the aqueduct, a hundred and fourteen arches have been built, whose total



LARGE RESERVOIR AT BROOKLINE.

length is nine thousand eight hundred and ninety-five feet. Thirty-five ventilators, raised fourteen feet above the soil, and placed at two miles distance apart, permit the circulation of air in this immense subterranean canal, and allow of descending into it when there are repairs to be made.

The Croton Aqueduct furnishes New York about twenty-seven million gallons of water in twenty-four hours, when the water is at the lowest. This liquid mass is collected in the first reservoir, and flows thence to the second, whence it is distributed to the city.

"MERRIE ENGLAND."

We have no fault to find with all the kindly things that are said just now about the mother country, and we think sincerely that it is about time to bury old grievances, and to let by-gones be by-gones. But when England is held up by Anglomaniacs as a model, we feel disposed to check the spurious enthusiasm by the statement of a few facts respecting her much-vaunted government. In England the elective franchise is held by 1 in every 19 of the gross population; in Scotland by 1 in 30, and in Ireland by 1 in 43! Hurrah for the British constitution! A majority of the House of Commons is elected by one-fifth of the total registered electors of Great Britain! About one-third of the House of Commons is so constituted that it embraces only 6 marquises, 7 earls, 21 viscounts, 34 lords, 25 right honorables, 47 honorables, 56 baronets, 9 knights, 8 lord-lieutenants, 75 deputy and vice-lieutenants, 53 magistrates, 64 placemen, 108 patrons of church livings, 3 admirals, 3 lieutenant-generals, 3 major-generals, 22 colonels, 28 lieutenant-colonels, 16 majors, 43 captains in the army and navy, 21 lieutenants in the same, and 4 cornets.

The soil of Great Britain is divided among 30,000 persons. In 1780, the total number of landed proprietors in England was 250,000, instead of 30,000 as now, and that number is rapidly diminishing, as the process of absorption goes on. The expenses of the royal family, their private spending money, levied in taxes on the nation, amount only to about £700,000 per annum, of which Prince Albert (poor fellow!) receives only about forty or fifty thousand! The expenses of maintaining the royal residences are only about £70,000 a year. The coachmen, postilions, and footmen of the queen cost a mere trifle annually — a bagatelle of £12,563. The expenditure of the royal steward for one year (according to the civil list) was £63,907, one item of which was £3130 for washing table linen. From this item it appears that 250,000 table cloths, at 3d. each, must have passed through the hands of the washerwoman, or about linen enough to encircle the entire globe! The full regalia of the crown, to be sure, is rather expensive, it must be confessed—the cost of the jewels alone in the royal bauble being £111,900. The annual cost of the executive government of Great Britain is £919,453, which is only about fifty-seven times the cost of our own, and when we consider what a fine thing it is to be governed as the British people are governed, who but a miser would count the difference?

Then the British institutions can boast of a list of pensioned officials—a thing unknown to our unsophisticated. There is scarce one of these gentlemen who does not receive a salary larger than the highest paid to any of our governors. The annual cost of the diplomatic corps is £344,275; but then, for the credit of the country, the noble and honorable ambassadors and envoys live like gentlemen! Of the pensioners for "civil services," many of whom are ladies of slender reputation, some receive £4000 per annum. The Grafton peerage has cost the British nation two millions fifty-seven thousand six hundred and fifty-eight pounds sterling—the House of Marlborough a million and a half sterling! Then what a fine thing glory is! Let us see at how cheap a rate the "Meteor flag of England" has been supported. The peace establishment of England in thirty-four years cost £549,083,112; the average annual expenditure being nearly equal to that of the whole annual cost of our executive government.

But the church establishment is the crowning glory of the British nation. The revenues of the English church (Church of England and Wales, not reckoning Ireland) amount to £10,000,000 annually in round numbers. The revenue of the Archbishop of Canterbury amounted in one year (1843) to £27,705, that of the Archbishop of York to £20,141 How well do these beneficiaries obey the injunction of Scripture, "not to be given to filthy lucre," because "they that will be rich fall into temptations and a snare, and into many foolish and hurtful lusts, which drown men in destruction and perdition." On the beauties of the State Church of Ireland we have not space to enlarge. Suffice it to say, by way of specimen, that in eight parishes in Ireland, there are 173 church members, that the tithes amount to £4860, and that consequently each man, woman and child costs about £28 per annum. Who will dare deny, after reading the above (in which it will be observed that the sums stated are pounds sterling, the pound being equivalent to $4 84 of our currency) that England is a great nation, that the blessings promised and bestowed of the British government and throne are unspeakable, and that John Bull ought to be, if he is not, the happiest animal on the face of creation?

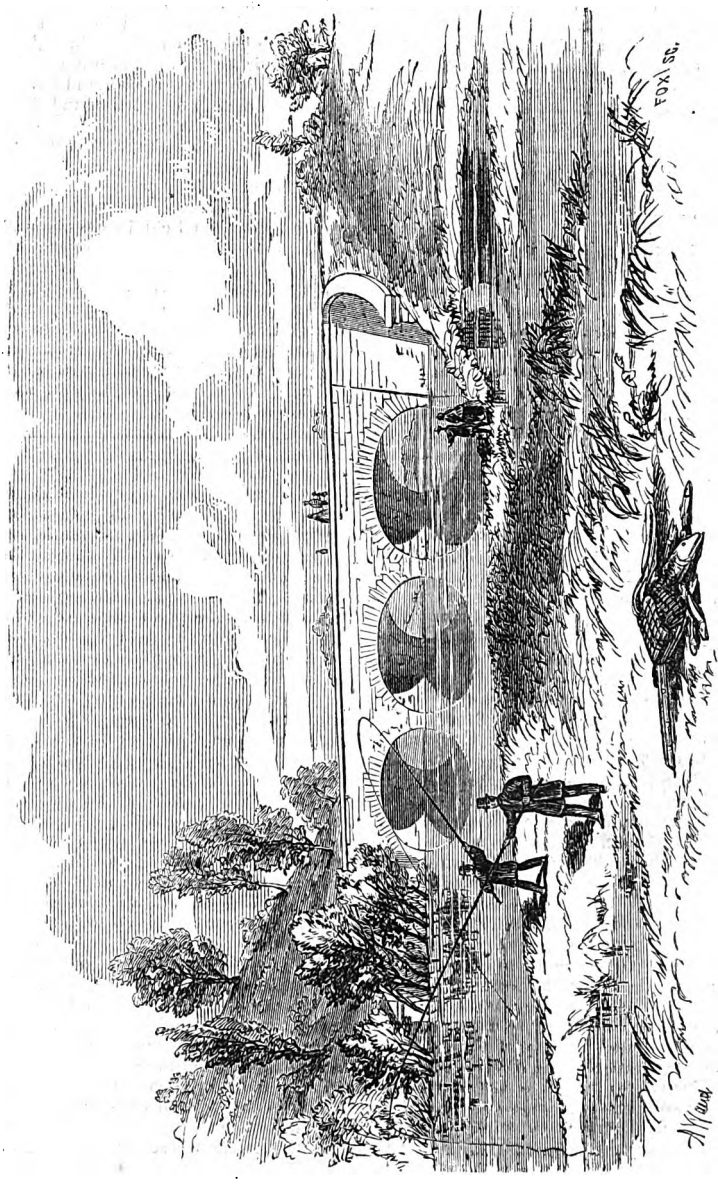
A CHEERFUL FACE.

There is no greater every-day virtue than cheerfulness. This quality in man among men is like sunshine to the day, or gentle, renewing moisture to parched herbs. The light of a cheerful face diffuses itself, and communicates the happy spirit that inspires it. The sourest temper must sweeten in the atmosphere of continuous good humor. As well might fog, and cloud, and vapor, hope to cling to the sun-illumined landscape, as the blues and moroseness to combat jovial speech and exhilarating laughter. Be cheerful always. There is no path but will be easier travelled, no load but will be lighter, no shadow on heart or brain but will lift sooner in presence of a determined cheerfulness. It may at times seem difficult for the happiest tempered to keep the countenance of peace and content; but the difficulty will vanish when we truly consider that sullen gloom and passionate despair do nothing but multiply thorns and thicken sorrows. Ill comes to us as providentially as good—and is a good, if we rightly apply its lessons; why not, then, cheerfully accept the ill, and thus blunt its apparent sting? Cheerfulness ought to be the fruit of philosophy and of Christianity. What is gained by peevishness and fretfulness—by perverse sadness and sullenness? If we are ill, let us be cheered by the trust that we shall soon be in health; if misfortune befall us, let us be cheered by hopeful visions of better fortune; if death robs us of the dear ones, let us be cheered by the thought that they are only gone before, to the blissful bowers where we shall all meet, to

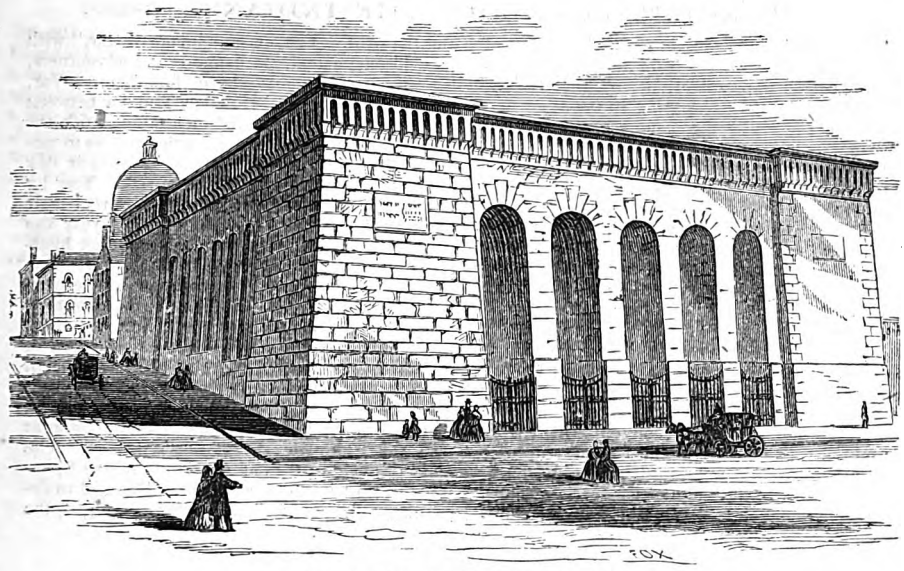
part no more forever. Cultivate cheerfulness, if only for personal profit. You will do and bear every duty and burden better by being cheerful. Nothing so helps self-control as cheerfulness. It will be your consoler in solitude, your passport and commendator in society. You will be more sought after, more trusted and esteemed for your steady cheerfulness. The bad, the vicious, may be boisterously gay, and vulgarly humorous but seldom or never truly cheerful. Genuine cheerfulness is an almost certain index of a happy heart and a pure and quiet spirit.—*Boston Traveller.*

ANECDOTE OF GARRICK.

When Garrick was in Paris, Preville, the celebrated French actor, invited him to his villa, and being in a gay humor, he proposed to go in one of the hired coaches that regularly plied between Paris and Versailles, on which road Preville's villa was situated. When they got in, Garrick ordered the coachman to drive on; but the driver answered that he would as soon as he got his complement of four passengers. A caprice immediately seized Garrick. He determined to give his brother player a specimen of his art. While the coachman was attentively looking out



BRIDGE OVER CHARLES RIVER, NEWTON LOWER FALLS.



BEACON HILL RESERVOIR, BOSTON.

or passengers, Garrick slipped out at the door, went round the coach, and by his wonderful command of countenance, palmed himself upon the coachman as a stranger. This he did twice, and was admitted into the coach each time as a fresh passenger, to the astonishment and admiration of Preville. Garrick whipped out a third time, and addressed himself to the coachman, who said, in a surly tone, that "he had got his complement;" he would have driven off without him had not Preville called out that as the stranger appeared to be a very little man, they would accommodate the gentleman and make room for him.—*Theatrical Annals.*

A SOLDIER OF FORTUNE.

The Paris Journal des Debats, in the course of a letter from Shanghai, states that a number of foreign adventurers have joined the imperial troops, and in their conflicts with the Tai-Ping rebels, are achieving a desperate and bloody reputation. Among these soldiers of fortune is an American named Ward, who, it appears, agrees to capture cities by job-work. The correspondent writes: "Ward had collected a troop of four to five thousand Tagals, belonging to Manilla, and about a dozen sailors from different seaports of the east. He and his men were paid by Tou-Tai, or Mayor of Shanghai, three hundred and fifty taels, or about three thousand francs a month, and he enjoyed the title of colonel. The retaking of Sung-Kiang brought the gallant colonel the sum of 87,500 francs. The city of Tsing-Pow, near Shanghai, was taken by the rebels. The Tou-Tai was in great trepidation, but Ward re-assured him, and offered to make all right for a personal reward of 300,000 francs. Arrived at Tsing-Pow he gave the signal of assault, and was received by a shower of balls. But Ward is brave, and he determined to prove himself worthy the confidence of the Tou-Tai. Twice repulsed, twice he returned to the charge. Climbing the walls with but about fifty of his followers, he found himself face to face with the chief of the Tai-Pings; he fired at him twice but missed. 'You rascal,' replied his adversary, *in good English, 'I'll show you I can fire better* than you!' and he did show it by shooting the colonel in the stomach and leg. Yet Ward escaped, though the greater portion of his men were lost. He is now at Shanghai; and as he is of good constitution, it is probable that in a few weeks he will be up again and at the head of a band of brigands, anxious to repair his ill luck."

COLLECTING POSTAGE STAMPS.

The Boston Daily Advertiser says that there is now a mania in some circles for collecting postage stamps of all nations. Some collections number three hundred varieties. It says the comparisons of the different heads and legends adopted by the several powers of the world, makes the collections something more than a mere pastime, and gives to it something of the dignity and value of a collection of coins or medals. The stamps of Mauritias and Hawaii, we believe, are accounted among the most rare, and next to these may be named the Russian, for which, acting as amateur stamp-broker, we should readily be authorized to offer a half dozen of the more common Italian, German, or French varieties, and perhaps hundreds of English or American. The great variety of stamps obtainable ceases to be surprising when it is recollected that in each of the countries where they are employed at all, several denominations are issued; and in some of them (as in the United States) there are old and new patterns, all of which are necessary in a complete collection. This elegant and curious "mania" is now chiefly indulged by young ladies, but we cannot tell how soon it may take possession of more mature persons.